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## Fauna of Ascoidea (except Ameroseiidae) in Guilan province, Iran with two new species record for Iran mites fauna

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**A b s t r a c t :** A faunistic study of superfamily Ascoidea (Acari: Mesostigmata) except family Ameroseiidae in Guilan province, Northern Iran was carried out during 2015-2016. During this study 13 species of seven genera belong to two families Ascidae and Melicharidae were collected and identified. Four species namely *Asca aphidiooides* (LINNAEUS), *Zerconopsis michaeli* EVANS & HYATT, *Antennoseius (Antennoseius) bacatus* ATHIAS-HENRIOT from family Ascidae and *Proctolaelaps scolyti* EVANS from family Melicharidae are new records for the mites fauna of Guilan Province. *Proctolaelaps fiseri* SAMŠÍNÁK (Melicharidae) and *Zerconopsis remiger* (KRAMER) (Ascidae) are new for Iran mites fauna. Expanded descriptions including illustrations of the adult female of *Proctolaelaps fiseri* and *Zerconopsis remiger*, respectively are provided based on the Iranian material.

**K e y w o r d s :** Fauna, Ascoidea, Mesostigmata, New records, Iran.

### Introduction

The superfamily Ascoidea is richly represented in tropical, temperate, and arctic alpine regions, where many of its members are free-living predators of nematodes and micro-arthropods in soil or humus and suspended arboreal litter habitats. Others are adapted to more specialized niches, where they feed on fungi, pollen, or nectar (KRANTZ & WALTER 2009). Superfamily Ascoidea includes three families, Ameroseiidae, Ascidae and Melicharidae. The Ameroseiidae comprises 148 species of mites placed in 10 genera (BEAULIEU et al. 2011) which are known to feed on pollen, nectar and fungi (BAKER & DELFINADO BAKER 1985; SEEMAN & WALTER 1995; HALLIDAY 1997). Many of the mites traditionally reported as Ascidae have been observed to feed on fungi while others have mainly been reported to feed on nectar or pollen, or to prey on other mites, insects or nematodes (MORAES et al. 2015). Some are found in association with insects or birds that may serve as their transporters; cases of true parasitism or other feeding habits have rarely been reported. Data on the long list of biological and ecological studies of mites of this group were summarized by MORAES et al. (2015). Species known for their predatory habits have been considered potentially useful as biological control agents of pest organisms (GERSON et al. 2003; MORAES et al. 2015). Family Ascidae includes two subfamilies, the Arctoseiinae and the Ascinae (LINDQUIST et al. 2009). The Melicharidae is probable sister group of the Ameroseiidae based on a uniquely shared modification of the cheliceral pilus dentilis. This diverse group has adapted to a broad spectrum of terrestrial and aboveground habitats similar to those of ameroseiids (LINDQUIST & EVANS 1965; GHILYAROV & BREGETOVA 1977; KARG 1993; HALLIDAY, WALTER &

LINDQUIST 1998; GWIAZDOWICZ 2007). Although many species of melicharids are predatory, others have adapted to feeding on fungi, pollen, and nectar, but one species is reported to be parasitic on cockroaches (EGAN & HUNTER 1975).

Base on last catalogue of world species of Ascidae, Blattisociidae and Melicharidae (Acari: Mesostigmata), 372 species in 17 genera of family Ascidae and 206 species in 11 genera of family Melicharidae were recorded (DE MORAES et al. 2016). Fauna of Superfamily Ascoidea in Iran were studied by a number of researchers (RAJAEI et al. 2011; ZARE et al. 2012; MAHJOORI & HAJIZADEH 2014; HASANVAND et al. 2015). An annotated checklist of Iranian Mesostigmata (Acari), excluding the family Phytoseiidae were provided, in this checklist 32 species belonging to 10 genera of family Ascidae and 10 species belonging to 2 genera of Melicharidae were reported (KAZEMI & RAJAEI 2013). An identification key was provided for the Northern Iran ascid mites (HAJIZADEH et al. 2009).

In comparison with other groups of mites fauna of superfamily Ascoidea of Iran was poorly known. The aim of the present study was a faunistic investigation on the Superfamily Ascoidea and present a checklist for known species (except Ameroseiidae) in Guilan Province, Iran.

## Materials and methods

A faunal study on Superfamily Ascoidea was carried out in Guilan Province, Northern Iran during 2015-2016. Mites were extracted from collected samples by placing them on Berlese funnel. Specimens preserved in 75% ethanol, cleared in Nesbitt's fluids and mounted on microscopic slides using Hoyer's medium. The slides were placed in at 45°C for two weeks. The mites were examined under an Olympus BX51 (Olympus Optical Co., LTD., Tokyo, Japan) microscope and identified using valid keys (HALLIDAY et al. 1998; KARG 1993; GHILYAROV & BREGETOVA 1977; LINDQUIST 1994; KALUZ & FENDA 2005; LINDQUIST & MAKAROVA 2012; HAJIZADEH et al. 2009; MAKAROVA & LINDQUIST 2013). The voucher material which comprises slide mounted specimens is deposited in the Department of Plant Protection at University of Guilan, Rasht, Iran.

## Results

In the current study 13 species belonging to 7 genera from Superfamily Ascoidea (except Ameroseiidae) were collected and identified, in Guilan province Iran. Four species and two genera are new records for mites fauna of Guilan Province. *Proctolaelaps fiseri* SAMŠIŇÁK (Melicharidae) and *Zerconopsis remiger* (KRAMER) (Ascidae) are new for Iran mites fauna. A checklist for known species of families Ascidae and Melicharidae in Guilan province is provided. Female specimens of *Proctolaelaps fiseri* and *Zerconopsis remiger* were described and illustrated based on the Iranian material.

### Checklist of families Ascidae and Melicharidae in Guilan province Iran

#### Superfamily A s c o i d e a

##### Ascidae OUDEMANS, 1905

***Asca* VON HEYDEN, 1826*****Asca aphidioides* (LINNAEUS, 1758)**

**M a t e r i a l e x a m i n e d :** Five females, Iran, Guilan province, Sangar city,  $37^{\circ}10'42''N$ ,  $49^{\circ}41'38''E$ , September 2015, collected from soil. Collected by F. Karami.

**D i s t r i b u t i o n :** Slovakian, Poland, southern Croatia, Hungary, Iran (KALUZ & FENDA 2005; GWIAZDOWICZ 2007; KAMCZYC & GWIAZDOWICZ 2009; KACZMAREK & MARQUARDT 2010; KONTSCHÁN & UJVARI 2013; KAZEMI & RAJAEI 2013).

***Asca bicornis* (CANESTRINI & FANZAGO, 1887)**

**M a t e r i a l e x a m i n e d :** Two females, Iran, Guilan province, Rostamabad city, Kaluraz village,  $36^{\circ}53'54.00''N$ ,  $49^{\circ}29'26.00''E$ , July 2016, collected from olive soil. Collected by F. Karami.

**D i s t r i b u t i o n :** Europe and North America, Poland, Turkey, Hungary, Iran (KALUZ & FENDA 2005; GWIAZDOWICZ 2007; CAKMAK et al. 2011; KONTSCHÁN & UJVARI 2013; MAHJOORI & HAJIZADEH 2014).

***Protogamasellus* KARG, 1962*****Protogamasellus mica* (ATHIAS-HENRIOT, 1961)**

**M a t e r i a l e x a m i n e d :** Five females, Iran, Guilan province, Sangar city, Eslamabad (Shaqaji) Village,  $37^{\circ}22'22''N$ ,  $49^{\circ}20'14''E$ , July 2016, collected from Chicken manure. Collected by F. Karami.

**D i s t r i b u t i o n :** Ethiopia, Tanzania, Australia, Europe, Poland, Brazil, Iran (GENIS et al. 1967; HURLBUTT 1971; HALLIDAY et al. 1998; KARG 2007; GWIAZDOWICZ 2007; MINEIRO et al. 2009; HAJIZADEH et al. 2009; KAVIANPOUR et al. 2011; SALARZEHİ et al. 2011; BALOOCH-SHAHRYARI et al. 2012; KAZEMI & RAJAEI 2013; MAHJOORI & HAJIZADEH 2014).

***Protogamasellus massula* (ATHIAS-HENRIOT, 1961)**

**M a t e r i a l e x a m i n e d :** Five females, Iran, Guilan province, Sangar city, Eslamabad (Shaqaji) Village,  $37^{\circ}22'22''N$ ,  $49^{\circ}20'14''E$ , July 2016, collected from Chicken manure. Collected by F. Karami.

**D i s t r i b u t i o n :** Australia, North Africa, Iran (HALLIDAY et al. 1998; KARG 2007; SHAMSI et al. 2008; KAVIANPOUR et al. 2011; ALIZADEH & SHIRDEL 2012; BALOOCH-SHAHRYARI et al. 2012; KAZEMI & RAJAEI 2013; MAHJOORI & HAJIZADEH 2014).

***Gamasellodes* ATHIAS-HENRIOT, 1961*****Gamasellodes bicolor* (BERLESE, 1918)**

**M a t e r i a l e x a m i n e d :** Three females, Iran, Guilan province, Roodbar (Nesfi village),  $36^{\circ}50'44.85''N$ ,  $49^{\circ}30'4.60''E$ , July 2016, collected from weed floor of olive Garden. Collected by F. Karami.

**D i s t r i b u t i o n :** Europe, North and South America, Africa and Asia, Turkey, Iran (KARG 1993; BHATTACHARYYA & SANYAL 2002; CAKMAK et al. 2011; SOLEIMANI et al. 2011; KAVIANPOUR et al. 2011; MALEK-SHAHKOYI et al. 2011; MONTAZERI et al. 2011; SALARZEHİ et al. 2011; NAZARI-TAJANI 2012; KAZEMI & RAJAEI 2013; MAHJOORI & HAJIZADEH 2014).

### ***Zerconopsis* HULL, 1918**

#### ***Zerconopsis michaeli* EVANS & HYATT, 1960**

**M a t e r i a l e x a m i n e d :** One female, Iran, Guilan province, Rasht, Saravan forest, 37°06'35"N, 49°66'12"E, June 2015, collected from forest soil. Collected by F. Karami.

**D i s t r i b u t i o n :** Poland, Hungary, Italy, Iran (GWIAZDOWICZ 2007; KONTSCHÁN 2007; PLUMARI 2009; KONTSCHÁN & UJVARI 2013; KAZEMI & RAJAEI 2013).

#### ***Zerconopsis remiger* (KRAMER, 1876)**

**M a t e r i a l e x a m i n e d :** Nine females, Iran, Guilan province, Langarud, 37°11'0"N, 50°9'0"E, July 2011; Chaboksar, 36°58'0"N, 50°35'0"E, August 2011 and 2015, collected from soil samples of citrus garden. Collected by Maedeh Nazari and F. Karami.

**D i s t r i b u t i o n :** Slovakian, Poland, Hungary (KALUZ & FENDA 2005; GWIAZDOWICZ 2007; KONTSCHÁN & UJVARI 2013).

**Remarks:** This is the first record of this species from Iran.

### ***Arctoseius* THOR, 1930**

#### ***Arctoseius cetratus* (SELLNICK, 1940)**

**M a t e r i a l e x a m i n e d :** Four females, Iran, Guilan province, Sangar city, Sarvandan village, 37°10'42"N, 49°41'38"E, September 2015, collected from manure. Collected by F. Karami.

**D i s t r i b u t i o n :** Slovakian and Australia, Poland, Iran (KALUZ & FENDA 2005; GWIAZDOWICZ 2007; SHAMSI et al. 2008; HAJIZADEH et al. 2009, 2010; MORADIAN et al. 2011; KAVIANPOUR et al. 2011; MALEK-SHAHKOYI et al. 2011; NAGHIBINEJAD et al. 2011; MONTAZERI et al. 2011; SOLEIMANI et al. 2011; MASNAVIPOUR et al. 2011; KHADEMPOUR et al. 2012; KHORSAND et al. 2012; MANESHI et al. 2012; ZARE et al. 2012; MEHRZAD et al. 2012; BALOOCH SHAHRYARI et al. 2012; ALIZADEH & SHIRDEL 2012; NEMATI et al. 2012; ELIADERANI et al. 2013; KAZEMI & RAJAEI 2013; MAŠÁN 2014).

### ***Antennoseius* BERLESE, 1916**

#### ***Antennoseius (Antennoseius) bacatus* ATHIAS-HENRIOT, 1961**

**M a t e r i a l e x a m i n e d :** One female, Iran, Guilan province, Rasht, Saravan forest, 37°06'35"N, 49°66'12"E, June 2015, collected from soil of forest trees. Collected by F. Karami.

**D i s t r i b u t i o n :** USSR, South and Central Europe, Slovakian, Iran (GHILYAROV & BREGETOVA 1977; FENDA & KALUZ 2009; KAZEMI et al. 2011; ARJOMANDI et al. 2011; MORADIAN et al. 2011; SOLEIMANI et al. 2011; BEYZAVI & OSTOVAN 2012; NEMATI et al. 2012; KAZEMI & MORAZA 2013; KAZEMI & RAJAEI 2013).

### ***Iphidozercon* BERLESE, 1903**

#### ***Iphidozercon caspius* HAJIZADEH et al., 2014**

**D i s t r i b u t i o n :** Iran, Guilan Province, Langarud city (37°11'N, 50°9'E) (HAJIZADEH et al. 2014).

**Melicharidae HIRSCHMANN, 1962*****Melichares* HERING, 1838*****Melichares agilis* HERING, 1838**

Distribution: Slovakian, Turkey, Iran, Guilan Province, related with livestock (FENDA & KALUZ 2009; CAKMAK et al. 2011; KAZEMI & RAJAEI 2013).

***Proctolaelaps* BERLESE, 1923*****Proctolaelaps ventrianalis* KARG, 1971**

Material examined: One female, Iran, Guilan province, Langarud, 37°11'0''N, 50°9'0''E, July 2015, collected from soil of citrus garden. Collected by F. Karami.

Distribution: Turkey, Iran (CAKMAK et al. 2011; KAVIANPOUR et al. 2011; MONTAZERI et al. 2011; KAZEMI & RAJAEI 2013).

***Proctolaelaps pygmaeus* (MÜLLER, 1860)**

Material examined: 12 females, Iran, Guilan province, Rasht, Pir Kola Chah Village 37°16'36''N, 49°37'30''E, August 2015; Sowme'eh Sara, 37°30'49''N, 49°31'78''E, October 2016, collected from rice hulls; Sangar city, 37°10'42''N, 49°41'38''E, August 2015, collected from soil sample of spruce tree; Sangar city, Sarvandan Village, 37°10'42''N, 49°41'38''E, September 2015, collected from manure; Sangar city, Eslamabad (Shaqaji) Village, 37°22'22''N, 49°20'14''E, October 2016, collected from manure. Collected by F. Karami.

Distribution: Japan, Australia, Indonesia, North America, New Zealand, South Africa, Algeria's, Slovakian, Poland, Turkey, Iran (HALLIDAY et al. 1998; MAŠÁN & STANKO 2005; GWIAZDOWICZ et al. 2006; CAKMAK et al. 2011; ZARE et al. 2012; KAZEMI & RAJAEI 2013).

***Proctolaelaps fiseri* SAMŠIŇÁK, 1960**

Material examined: One female, Iran, Guilan province, Rasht, University of Guilan, 37°19'36''N, 49°64'12''E, August 2015, collected on body of rove beetle (Staphylinidae). Collected by F. Karami.

Distribution: North America, German and Georgian, Finland, Central Europe (LINDQUIST & HUNTER 1965; BURJANADZE et al. 2008; PENTTINEN et al. 2013; CEJKA & HOLUSA 2014).

Remarks: This is the first record of this species from Iran.

***Proctolaelaps scolyti* EVANS, 1958**

Material examined: One female, Iran, Guilan province, Rasht, Emamzadeh Hashem, 37°02'34''N, 49°62'10''E, August 2016, collected from rotten fruit of pomegranate. Collected by F. Karami.

Distribution: Slovakian, Austria, Latvia, Turkey, Iran (KRISTOFÍK et al. 2003; MOSER et al. 2005; SALMANE 2007; SALMANE & BRUMELIS 2010; CAKMAK et al. 2011; KAZEMI & RAJAEI 2013).

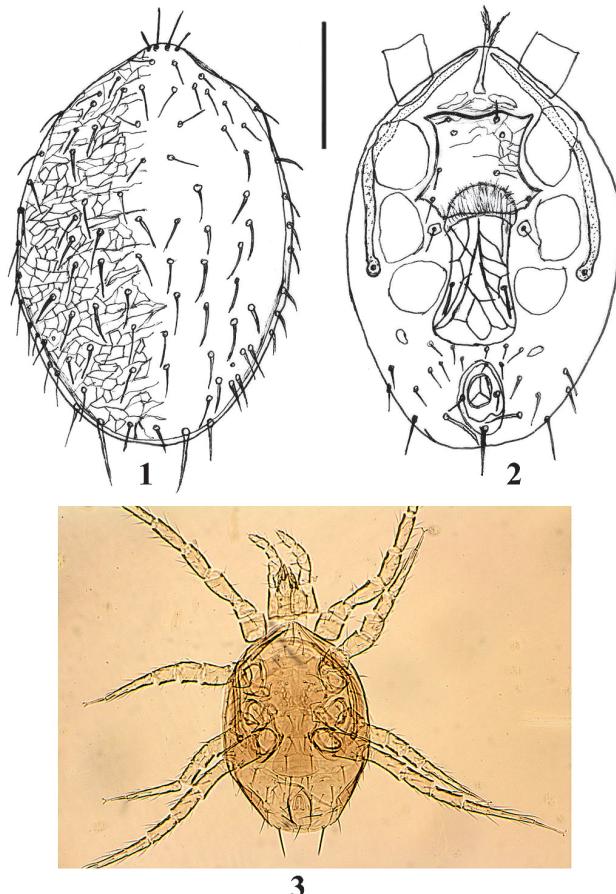
### Description of new records for Iran

#### *Proctolaelaps fiseri* SAMŠIŇÁK, 1960 (Figs 1-3)

Female (one specimen measured)

Material examined: One female mite, details are available in the checklist part.

Dorsal idiosoma (Fig. 1): Dorsal shield 424  $\mu\text{m}$  long and 296  $\mu\text{m}$  wide, evenly reticulated over entire surface, pattern not distinctively changed on particular areas. Dorsal shield with 42 pairs of setae, the tips of only a few of them extend to the bases of the following setae; in the humeral region all of the setae are of about the same length.



Figs 1-3. *Proctolaelaps fiseri* female. (1) Dorsal view of idiosoma; (2) Ventral view of idiosoma; (3) Body picture. Scale bar: 140  $\mu\text{m}$  for (1), (2); 270  $\mu\text{m}$  for (3).

Ventral idiosoma (Fig. 2): Tritosternum bifurcate, with marginally pilose laciniae. Sternal shield evenly reticulated over nearly entire surface but smooth posteri-

orly; anterior margin of shield well defined; posterior margin truncate or slightly convex, with posterolateral corners slightly emarginated. Third pair of sternal pores on metasternal plates. Endopodal plates strongly formed between coxae III and IV. Genital shield strongly reticulated, with distinct corners, but little widening behind genital setae, with membranous anterior margin rounded, extending to level of third pair of sternal setae. Bearing a pair of genital setae. Anal shield lightly reticulated, with anterior margin smoothly rounded; anal opening enlarged. Eight pairs of ventral setae on membrane around anal shield. Peritrematal shields free posteriorly from strong exopodal plate curving behind coxa IV; peritremes reaching nearly to the vertical setae j1.

**L e g s :** Legs I and IV slightly shorter than dorsal shield; tarsi II to IV with pair of apical seta-like processes, subapical setae long, spine-like. Pretarsi with moderate length, those of legs III-IV slightly longer than basitarsi.

**G n a t h o s o m a :** Corniculi well spaced, parallel; internal malae moderately wide, blunt, slightly shorter than corniculi. Venter of hypostome with 6 transverse rows of denticles, each row evenly multidenticulate; fifth row widened, gently concave; sixth row widened, free. Anterior rostral setae not enlarged. Tectum trifid. Fixed digit of chelicerae with row of 16 teeth, with short dorsal projection over base; movable digit tridentate, with 1 ventral spine near base.

#### ***Zerconopsis remiger* (KRAMER, 1876) (Figs 4-6)**

Female (one specimen measured)

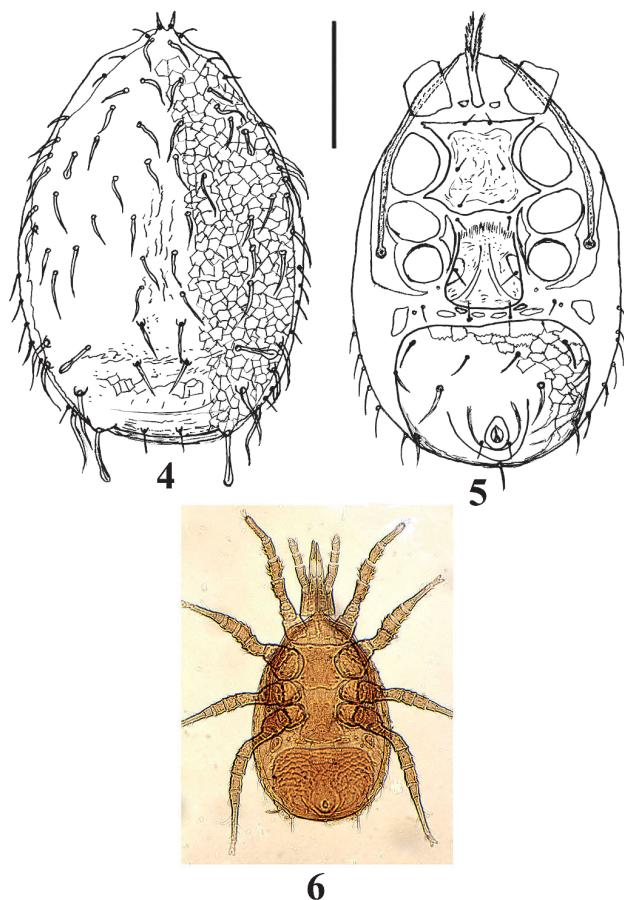
**M a t e r i a l e x a m i n e d :** Nine female mites, details are available in the checklist part.

**D o r s a l i d i o s o m a** (Fig. 4): Dorsal shield with 560  $\mu\text{m}$  long and 368  $\mu\text{m}$  wide, proximal and lateral sides covered with a distinct reticulated pattern; posterior and central areas with fine irregular network pattern. Anterior dorsal shield with 22 pairs of setae of which one pair is paddle-like, the remainder simple; vertical setae j1 short, each on a tubercle. Posterior dorsal shield with 14 pairs of setae of which two pairs are paddle-like and the remainder simple; J5 are the shortest.

**V e n t r a l i d i o s o m a** (Fig. 5): Tritosternum with short base and pilose laciniae, and flanked by a narrow pair of pre-endopodal shields. Sternal shield with a fine granular pattern and bearing three pairs of simple setae. Genital shield with granular markings, and bearing one pair of setae. Ventrianal shield heavily reticulated and bearing six pairs of simple setae. With six platelets between the genital and ventri-anal shields. Peritrematal shields curving behind coxa IV; peritremes reaching nearly to the vertical setae j1. Metapodal plates conspicuous. With one pair of large, subtriangular metapodal shields.

**L e g s :** Legs I with the tarsus longer than the tibia; claws small, pulvillus short. Tarsus I smooth with fine setae; tibia, genu and femur with majority of setae arising from strong tubercles. Tarsi II-IV with a pair of lanceolate setae; ambulacra with median lobes of pulvilli rounded apically.

**G n a t h o s o m a :** Venter of gnathosoma with rostral and internal palptrochanter setae long, whip-like. All setae on pedipalp simple. Tectum three-pronged. Fixed digit of chelicerae with 2 teeth and a setiform pilus dentilis; movable digit with 2 teeth.



**Figs 4-6.** *Zerconopsis remiger* female. (4) Dorsal view of idiosoma; (5) Ventral view of idiosoma; (6) Body picture. Scale bar: 180 µm for (1), (2); 370 µm for (3).

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We wish to thank Ms. Maedeh Nazari for collection of some specimens of *Zerconopsis remiger* during her graduate studies at the University of Guilan during 2011-2012.

### Zusammenfassung

Eine faunistische Studie der Überfamilie Ascoidea (Acarı: Mesostigmata) mit Ausnahme der Familie Ameroseiidae in der Provinz Guilan (nördlicher Iran), wurde 2015 bis 2016 durchgeführt. Während dieser Untersuchung wurden 13 Arten aus sieben Gattungen, die zu zwei Familien Ascidae und Melicharidae gehören, gesammelt und identifiziert. Vier Arten, nämlich *Asca aphidoides* (LINNAEUS), *Zerconopsis michaeli* EVANS & HYATT, *Antennoseius (Antennoseius) bacatus* ATHIAS-HENRIOT aus der Familie Ascidae und *Proctolaelaps scolyti* EVANS aus der Familie

Melicharidae sind Neunachweise für die Milbenfauna der Provinz Guilan. *Proctolaelaps fiseri* SAMŠIŇÁK (Melicharidae) und *Zerconopsis remiger* (KRAMER) (Ascidae) sind neu für die Milbenfauna des Iran. Detailliert beschrieben werden *Proctolaelaps fiseri* und *Zerconopsis remiger* (mit Illustrationen von je einem adulten Weibchen) basierend auf dem iranischen Material.

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